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ABSTRACT

In 1992, the state of Iowa received the first of three grants to implement courses using the Iowa Communications Network (ICN), a fiber optic network that delivers live, full-motion instruction allowing two-way interaction between students and instructors. To evaluate the effectiveness of the ICN courses, surveys were distributed to 326 students in 22 summer courses at 8 community colleges to determine their perceptions related to technical aspects, sense of belonging in the course, instruction, course management, and overall satisfaction. Responses were received from 210 students in 18 courses, representing 58% of the courses taught over the ICN during summer 1994. Study findings included the following: (1) 97% of the respondents indicated that they had no trouble getting access to the classroom, while 93% agreed that the instructor paid attention to remote site students; (2) 90% stated that they felt that they were part of the class; (3) 88% indicated that, overall, they were satisfied with the course, while 87% indicated that they would take another interactive television class; and (4) remote site students appeared to be less satisfied than students at the origination site, with 11 survey items receiving negative responses by more than 25% of the remote respondents and only 3 items receiving such ratings by origination students. Recommendations for program improvement are included. Contains 28 references. (TGI)

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Students Near and Far: Differences in Perceptions of Community College Students Taking Interactive Television Classes at Origination and Remote Sites

by

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Students Near and Far: Differences in Perceptions of Community College Students Taking Interactive Television Classes at Origination and Remote Sites

by

Christine K. Sorensen

"For demographic, economic, political, and pedagogical reasons... distance learning is emerging as a vital strategy for American education in the 1990s" (Dede, 1990, p. 247).

Background

Expansion of Distance Education

In the last decade, telecommunications involving cable, fiber-optics, microwave, slow scan, satellite, and microcomputers have expanded educational opportunities (Barker, Frisbie, & Patrick, 1989). Distance education is seen as a medium where there can be a wider range of student skills, a reliance on higher quality teachers, and greater opportunities for students than there are available in traditional classrooms (Dede, 1990; 1991). Distance education has historically been primarily targeted to the adult population (Davis, 1983) and demands of adult students are leading to increases in the use of newer forms of distance education. Colleges and universities have seen enrollment growths in the nontraditional student population, those attending part-time and over age 22 (Jorgensen, 1986). Obsolescence in job skills, special movements demanding equal opportunities, and business demands for training and retraining are fueling adult demands for education. These adult students, typically located at a distance from the institution, are demanding greater and easier access to instructional opportunities.

In 1987, Congress authorized an initiative to promote use of telecommunications in education called the Star Schools Program Assistance Act. Initial funding was provided to multi-state public and private consortia offering satellite instruction (Simonson, 1994; Wilson, 1990). More recently, the Star Schools program has pushed new technologies to the forefront of distance education through the funding of demonstration projects utilizing fiber optic voice, video, and data transmission.

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In 1992, the state of Iowa received the first of three special statewide Star Schools grants to demonstrate the use of fiber-optic technology to provide live, two-way full-motion interactive instruction which allows greater levels of interactivity than previous forms of distance instruction (Simonson, 1994). The grant allowed the state to equip over 100 fully interactive video classrooms in community colleges, universities, and K-12 schools. By October, 1993, 103 two-way interactive video classrooms were connected to the Iowa Communications Network (ICN) and fully operational.

Iowa, with its focus on two-way fiber optic video instruction, illustrates the shift in distance education to group methods of instruction which allow "...sustained interaction among teacher and students..." (Garrison, 1990, p. 18), similar to the traditional classroom. As Iowa became a leader in the use of two-way interactive fiber optic technology for instructional delivery (Simonson, 1994), it became important that the effectiveness of this mode of delivery be assessed so that improvements could be made and others implementing this form of technology could learn from Iowa's experience. In addition, by looking for areas to improve satisfaction with ICN delivery, it was hoped that higher student motivation, fewer drop-outs, greater enrollment in distance education courses, and better learning would result.

Evaluation framework

As the technology changes and new distance education programs evolve, there is a need for evaluation to provide insights for improving practice. As technological innovations change the nature of distance education, educators need to assess the attitudes and opinions of students participating in the new learning environments. Biner (1993) and Biner, Dean and Mellinger (1994) suggest that distance education evaluation efforts should start with the assessment of student attitudes and opinions preceding assessment of learning outcomes, claiming that the study of learner satisfaction is an important criterion by which to judge the effectiveness and success of distance programs.

One theory of evaluation that focuses on attitude measurement and has been used in the field of distance education is that of Kirkpatrick (Biner, 1993; Biner, Dean, and Mellinger, 1994). Kirkpatrick (1979) recommends that a good evaluation begin with organized measurements of reactions and feelings

of those participating in the learning situation. He argues that people must like a program in order to obtain maximum benefits. The more positive the attitude, the more likely participants are to pay attention and to learn. By assessing attitudes, changes can be made in the program to address areas where there are negative reactions.

Previous Studies of Satisfaction with Distance Education

Overall, the evidence suggests that there are no differences in achievement between students taught in traditional classrooms and those in distance classrooms, whether achievement is measured by GPA, grades, exams, amount of material covered, or difficulty of the class. However, the preponderance of the evidence suggests that there are differences between the two instructional modes in levels of satisfaction. Wilkes and Burnham (1991), Silvernail and Johnson (1992), and Ritchie and Newby (1989) found relationships between satisfaction and involvement. Two studies (Silvernail and Johnson, 1992; Wilkes and Burnham, 1991) found that on-site students rated both satisfaction and involvement significantly higher than distant students. Ritchie and Newby (1989) found that classes where the instructor was not physically present had significantly lower ratings on involvement and overall satisfaction than either the traditional class or the television class with the instructor present in the room. Egan, Welch, Page, and Sebastian (1992) also found in their research that students consistently rate conventional instruction higher than distance instruction.

It could be argued that students in television classes where the instructor is physically present (origination) are likely to have a learning experience more similar to that of a traditional classroom than to that of their remote counterparts. However, Jurasek (1993) found that students at remote sites had significantly more positive attitudes than students at origination sites. Are there differences between origination and remote site students in their reactions to interactive television instruction delivered over high quality fiber-optic based systems?

Methodology

Instrument Development

In Iowa, where the fiber optic system is being used to provide instruction for both the K-12 and college levels, evaluators for the state project decided to use one evaluation instrument for both audiences. Existing instruments were reviewed (Barker & Platten, 1988; Bernt & Bugbee, 1993; Biner, Dean, & Mellinger, 1994; Egan, Welch, Page, & Sebastian, 1992; Kabat, 1991; Martin & Rainey, 1993; Ritchie & Newby, 1989; Silvernail & Johnson, 1992) and constructs identified. Several constructs appeared consistent in the literature and appeared to be applicable for both K-12 and community college level students in a two-way interactive television environment (Table 1). The constructs selected for measurement included: (1) technical aspects, (2) membership, (3) instruction, (4) course management, and (5) overall course satisfaction. Technical aspects included items that related to the adequacy of the equipment in the interactive television classroom. Membership was defined as a sense of being part of a class and is evidenced by involvement and participation in the class and a feeling of belonging. The instruction construct was designed to measure the attitude of the student about the instruction received in the class and about the learning environment. Course management was defined as the students' attitude toward logistical procedures and the provision of resources to students. Overall course satisfaction was to reflect the students' attitude toward the interactive distance education experience.

Table 1. Areas of emphasis found in survey instruments.

	Instrument					
Area	A	B	C	D	E	F
Instructor/Instruction	X	X	X		X	X
Technology/Technical Aspects	X	X	X			X
Management/Program Coordination	X	X	X		X	X
Support		X	X		X	X
Site Personnel		X				
Material Delivery		X				
Communication		X				
Learning Style				X	X	
Student Competency					X	
Student External Factors				X	X	
Peer Interaction			X			X
Perceptions of Value/Satisfaction						X

A list of Likert-scale items was generated to measure these constructs. These items were reviewed and refined over a period of two months. The Iowa Star Schools project included a Research and Evaluation Advisory Panel. One role of this panel was to review and provide input for evaluation instruments used in the project. Members of the advisory panel included representatives from the state's public universities, community colleges, Area Education Agencies, and the First in the Nation in Education (FINE) Foundation, as well as a research and evaluation specialist and a classroom teacher. Items were deleted, revised, or added based on the recommendations of this group. The surveys were then constructed and re-submitted to this group for approval.

The surveys included four-point Likert items (scale: 1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree), some items requesting demographic information, and two open-ended questions. Assistance with assuring an appropriate reading level for middle school students as well as high school and college age students was provided by teacher education faculty members at Iowa State University and the University of Northern Iowa. The Flesch grade level score for the IDEA instrument was 8.3, compared to grade level scores of 10.2, 11.7, 13.4, and 13.8 for the other instruments (instruments A, B, C, F on Table 1 containing a construct for technical aspects). Following further revisions and final approval, the surveys were printed on computerized scan sheets and distributed. Instruments were used to survey both community college and secondary courses taught over the ICN during 1994. Survey development and data collection were funded in part by the U. S. Department of Education Star Schools grant #R203 B 20001-93.

Surveying the Students

In the Iowa project, each of the state's fifteen community college regions has a person assigned to coordinate Star Schools activities in the region. These persons are referred to as regional coordinators. Regional coordinators were contacted in June 1994 and asked to survey all community college courses taught over the ICN during the summer session of 1994.

Only eight of the community colleges were offering summer courses over the ICN. In seven of the community colleges, all summer ICN courses were surveyed. The eighth community college has been

involved in interactive television instruction for over ten years and was offering thirteen courses. Four of those courses were randomly chosen to be surveyed. Of the 31 courses being taught over the ICN during summer 1994, permission was granted by the community colleges to survey 22, or 71 percent.

Regional coordinators were responsible for distributing surveys to the course instructors, collecting the surveys from the instructors, and mailing the completed forms to the evaluation team. Eighteen of the 22 courses returned surveys for a response rate of 82 percent. These eighteen courses represented 58 percent of the courses being taught over the ICN by community colleges during summer session 1994. Table 2 indicates the number of ICN courses conducted in each region, the number surveyed, and the number returning surveys.

Table 2: Survey return rates by community college.

Community College	N Courses Offered	N Surveyed	N Returned
Community College A	7	7	7
Community College B	13	4	4
Community College C	1	1	0
Community College D	4	4	3
Community College E	2	2	0
Community College F	1	1	1
Community College G	2	2	2
Community College H	1	1	1
TOTAL	**31**	**22**	**18**

The courses reflected a variety of content areas including mathematics, science, literacy, vocational education, business, art, and social sciences. The number of students enrolled in each course varied from seven to 46. Return rates were generally high although return rates in the individual courses varied considerably. Among the eighteen courses, eight had return rates of over 75 percent, five had return rates between 51 and 75 percent, four had return rates of 40 to 50 percent, and one had a return rate of under 40 percent. Return rates by course are listed in Table 3.

Table 3: Individual course return rates.

Course	Enrolled	Returned	Return Rate
A1 (math)	9	8	89%
A2 (math)	14	13	93%
A3 (business)	14	13	93%
A4 (business)	17	12	71%
A5 (business)	16	9	56%
A6 (business)	9	7	78%
A7 (business)	16	14	88%
B8 (vocational)	14	9	64%
B9 (math)	27	11	41%
B10 (science)	31	22	71%
B11 (literacy)	20	17	85%
D12 (business)	27	13	48%
D13 (vocational)	46	19	41%
D14 (science)	15	9	60%
F15 (literacy)	14	13	93%
G16 (art)	14	2	14%
G17 (business)	7	3	43%
H18 (history)	19	16	84%
TOTAL	**326**	**210**	**64%**

Testing the Instrument

A confirmatory factor analysis using the Statistical Package for the Social Sciences (SPSS) provided support for the five constructs identified in the literature and reflected in the survey. Maximum likelihood estimates were used and missing data were deleted on a pairwise basis. Both varimax and oblimin rotations were used with consistent results obtained for both.

Factor loadings are reported in Table 4. Only four items loaded in an unexpected manner. These four items were analyzed as single items and dropped from the constructs. Two of those items ("technical problems interfere with my learning" and "the fact that I am on TV inhibits my class participation") failed to load on any factor with a factor loading greater than .30.

Following the factor analysis, additional analysis was conducted to determine the reliability of the constructs. SPSS procedures were used to determine Cronbach alpha coefficients for each of the five constructs. Standardized Cronbach Coefficient Alpha estimates indicate that the constructs are reliable, with coefficients ranging from .64 to .91. Table 5 shows the Cronbach Alpha reliability estimate for each construct.

Table 4: Factor loadings for items in each construct.

Factor and Items	Varimax	Oblimin
Factor 1: Instruction		
The class is well organized.	.68	.72
The instructor pays attention to remote students.	.67	.67
The classroom is free of distractions.	.55	.52
I pay as much attention as I would in a regular class.	.53	.50
The instructor is available to answer my questions.	.52	.44
It is easy to pay attention to the instructor on the TV.	.50	.47
Factor 2: Membership		
I feel encouraged to become involved in class discussions and activities.	.74	.73
I feel the instructor is speaking directly to me.	.65	.64
I feel the students at the other site are part of my class.	.57	.52
I feel like I am part of the class.	.55	.45
Factor 3: Technical Aspects		
It is easy to see the TV monitor.	.83	.89
It is easy to use the microphone.	.47	.50
It is easy to hear comments made by students at the other site.	.36	.32
Graphics and other visuals are easy to read on the monitors.	.36	.33
Factor 4: Course Management		
Enrollment and registration procedures meet my needs.	.82	.82
It is easy to get information about ITV classes.	.54	.56
I have adequate access to the resources I need.	.48	.47
Factor 5: Course Satisfaction		
I would take another ITV class.	.79	.78
I would tell my friends to take an ITV class.	.73	.72
Overall, I am satisfied with my ITV class.	.62	.56
I am learning as much in the ITV class as I would in a regular class.	.44	.38
Single Items		
Technical problems interfere with my learning in the TV classroom.		
The fact that I am "on TV" inhibits my class participation.		
Remote site students receive class materials in a timely manner.		
I have had no problems in getting access to the classroom during the scheduled class time.		

Table 5: Reliability estimates for the survey constructs.

Construct	Reliability estimate (Cronbach alpha)
Instruction	.84
Membership	.87
Technical Aspects	.79
Course Management	.64
Course Satisfaction	.91

Based on initial results, it appears that the instrument developed for use in the Iowa Star Schools project is a reliable tool for measuring student attitudes in interactive television courses. The constructs identified through the factor analysis appear consistent with the literature. The use of computerized scan sheets and a limited number of items provide for time efficient data and limited the amount of instructional time needed for students to complete the instrument. This instrument appears to have useful applications in conducting formative evaluations of instructional programs utilizing two-way interactive telecommunications technology.

Findings

The following section will describe some of the findings from the evaluation of the community college students participating in interactive television courses over the ICN during summer 1994. The focus will be on describing their overall reaction to the classes as well as differences between the reactions of students at the remote and origination sites.

Description of Respondents

Two-hundred and ten community college students responded to the survey. They were:

- 37 percent male and 63 percent female;
- 85% Caucasian, 5% Black American, 4% Asian/Pacific Islander, 4% Native American, 1% Hispanic, and 1% other;
- 62% under age 25 and 38% over 25;
- 31% freshman students, 35% sophomores, and 35% other;
- 61% were taking their first interactive television course, 27% their second, and the remainder had taken three or more television courses;
- 51% were at a remote site and 49% at an origination site.

With the exception of previous experience in interactive television instruction, there appeared to be few differences in the demographic backgrounds of origination and remote site students as can be seen in Table 6.

Table 6: Description of students at remote and origination sites

Descriptor	% Origination (N=102)	% Remote (N=108)
Sex		
Female	61%	65%
Male	39%	35%
Ethnic Background		
Caucasian	85%	87%
Black American	5%	2%
Asian/Pacific Islander	4%	4%
Native American	3%	5%
Hispanic	1%	0%
Other	2%	2%
Age		
Under 25	60%	65%
Over 25	40%	35%
Classification		
Freshman	31%	32%
Sophomore	33%	39%
Other	36%	29%
Experience with ITV		
First experience	62%	47%
Second experience	15%	32%
Three or more	23%	21%

Individual Items

In evaluating the 25 Likert-scale items on the survey, it appears that, in general, the community college students were satisfied with their experience in the distance learning classroom. In assessing areas for improvement, a level of 25 percent dissatisfaction was set by the researcher; items where one-fourth or more of the students responded negatively were deemed areas in need of improvement. For 19 of the items, over three-quarters of the students indicated that they were satisfied. Over 75 percent agreed that:

- they have had no problem getting access to the classroom (97%);
- it was easy to see the TV monitor (94%);
- the instructor paid attention to remote site students (93%);
- enrollment and registration procedures were adequate (93%);
- they felt part of the class (90%);
- overall they were satisfied with the course (88%);
- the instructor was available to answer questions (88%);
- the class was well organized (88%);

- they would take another interactive television class (87%);
- it was easy to use the microphone (85%)
- they have adequate access to resources such as the library (84%);
- they would tell their friends to take an interactive television class (82%);
- they felt the instructor was speaking to them (82%);
- it was easy to pay attention (82%);
- it was easy to hear comments (81%);
- they were learning as much as in a regular class (78%);
- it was easy to read graphics and other visuals on the monitors (78%);
- they felt encouraged to become involved in class discussions (77%);
- and they paid as much attention as in a regular class (76%).

There were six areas that student ratings indicate improvement may be needed. Over one-quarter felt:

- technical problems interfered with their learning (42%);
- remote site students did not receive materials in a timely manner (35%);
- being "on TV" inhibited their class participation (29%);
- students at the other site(s) were not part of the class (27%);
- there were distractions in the classroom that interfered with learning (26%);
- and it was not easy to get information about television classes (25%).

However, a breakdown of responses by origination (where the instructor was present) and remote site students shows that remote site students were less satisfied in several areas. Over 25 percent of the remote site students responded negatively on eleven of the 25 items, while only three items met this criterion for origination site students. Origination site students indicated that:

- technical problems interfered with their learning (48%);
- remote site students did not receive materials in a timely manner (29%);
- and being "on TV" inhibited their class participation (26%).

The eleven areas where at least 25 percent of remote site students were not satisfied are listed below. The remote site students felt that:

- they did not receive materials in a timely manner (41%);
- technical problems interfered with their learning (38%);
- they did not pay as much attention as in a regular class (37%);
- being "on TV" inhibited their class participation (33%);
- there were distractions in the classroom that interfered with learning (33%);

- students at the other site(s) were not part of the class (32%);
- they were not encouraged to become involved in class discussions (28%);
- they were not learning as much as in a regular class (26%);
- the instructor was not speaking to them (25%);
- it was not easy to hear comments (25%);
- and it was not easy to get information about television classes (25%).

On most items, fewer remote site students responded positively as Table 7 shows.

Table 7: Percent of students indicating agree or strongly agree by origination and remote sites.

Construct and Items	Origination %	Remote %
Construct 1: Instruction		
The class is well organized.	91	86
The instructor pays attention to remote students.	94	91
The classroom is free of distractions. *	81	67
I pay as much attention as I would in a regular class. *	89	63
The instructor is available to answer my questions.	91	85
It is easy to pay attention to the instructor on the TV.	81	82
Construct 2: Membership		
I feel encouraged to become involved in class discussions.	80	72
I feel the instructor is speaking directly to me. *	90	75
I feel the students at the other site are part of my class.	77	68
I feel like I am part of the class.	92	88
Construct 3: Technical Aspects		
It is easy to see the TV monitor.	92	85
It is easy to use the microphone. *	78	91
It is easy to hear comments made by students at other site. *	87	75
Graphics and other visuals are easy to read on the monitors.	79	76
Construct 4: Course Management		
Enrollment and registration procedures meet my needs.	95	91
It is easy to get information about ITV classes.	75	75
I have adequate access to the resources I need.	86	82
Construct 5: Course Satisfaction		
I would take another ITV class.	86	87
I would tell my friends to take an ITV class.	84	80
Overall, I am satisfied with my ITV class. *	94	82
I am learning as much in the ITV class as I would in a regular class.	81	74
Single Items		
Technical problems interfere with my learning.	48	38
The fact that I am "on TV" inhibits participation.	26	33
Remote site students receive materials in a timely manner.	71	59
I have no problems getting access to the classroom.	95	98

* T-tests indicate statistically significant differences in remote and origination site ratings on this item (≤ .05). Scale: 1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree

Construct Comparisons

The four-point Likert scale items on the survey were grouped into five constructs and mean scores were calculated. As can be seen in Table 8, students appear to be satisfied with their distance education experience (mean=3.07), technical quality in the classroom appears to be adequate (mean=3.12), and the students are satisfied with the quality of the instruction they receive (mean=3.07). The areas in most apparent need of improvement appear to be membership (mean=2.96) and course management (mean=2.99). Table 8 also shows that remote student means for the constructs are slightly lower than means for the origination site students.

Table 8: Construct scores

Construct and Items	Overall Mean Score	Origination Mean Score	Remote Mean Score
Construct 1: Instruction *	*3.07*	*3.15*	*2.99*
Construct 2: Membership	*2.96*	*3.03*	*2.88*
Construct 3: Technical Aspects	*3.12*	*3.13*	*3.10*
Construct 4: Course Management	*2.99*	*3.01*	*2.97*
Construct 5: Course Satisfaction	*3.07*	*3.12*	*3.02*

* T-tests indicate statistically significant differences in remote and origination site ratings for this construct (≤ .05). Scale: 1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree

T-tests and Anovas

The constructs were compared using the Statistical Package for the Social Sciences (SPSS). Pooled t-tests were conducted to determine if there were statistically significant differences in the construct scores and ratings on individual items between students located at origination or remote sites. A significance level of .05 was set. Location of the student at the origination site (where the teacher was physically present) or the remote site appears to make a statistical difference in ratings of the instruction construct (as noted in Table 8) and in ratings on several individual items (as noted in Table 7). Students at the origination site had significantly higher ratings of instruction than students at remote sites indicating a more positive perception of the instructor and the instructional environment.

Individual items where origination site students gave significantly higher ratings than remote site students included paying as much attention as in a regular class, having a classroom free of distractions, feeling that the instructor is speaking directly to the student, ease of hearing comments made by students at other sites, and overall satisfaction with the interactive television class. The only item where origination site students gave significantly lower ratings than remote site students was ease of microphone use.

Some community college classes had only two sites connected while others had up to eight sites connected. A comparison of those with two sites versus those with more than two sites showed no statistically significant difference in student ratings . Comparison of ratings by students with no previous experience in an interactive television classroom versus those with previous experience also found no significant differences. Grade point averages for remote and origination site students were also compared with no statistically significant differences found. Overall GPA for origination site students was 3.42 with a 3.37 overall GPA for remote site students (10 classes reporting). These findings suggest that previous experience, use of multiple sites, and academic ability would not have affected rating differences between remote and origination site students.

Analysis of variance comparisons by type of class (mathematics, science, vocational, literacy, business, history, other) found that the history class had significantly lower ratings in several areas. The history student ratings were deleted and t-tests comparing remote and origination site ratings for individual items and constructs were reanalyzed. Results were consistent with the initial analysis suggesting that the lower ratings for the one history class did not account for the differences in remote and origination site ratings overall.

Regression Analysis

Analysis of the data was conducted using stepwise regression to determine the constructs most likely to predict student satisfaction. Both the satisfaction construct and the individual item related to overall satisfaction were used as dependent variables in different sets of analyses. The prediction equation remained the same regardless of which of these dependent variables was used.

In looking at the entire sample of community college students using the construct of satisfaction as the dependent variable, the first variable entered in the equation was instruction, accounting for 46 percent of the variance. Adding the variables of membership, course management, and technical aspects increased the variance prediction to 55 percent.

However, looking at the entire sample tended to mask some differences between the variables most likely to predict satisfaction for remote students versus origination site students. When the two groups were separated and stepwise regression analysis was conducted on each subset, results were slightly different. Although instruction was the first variable entered in the equations for both groups, other variables entered were different.

For remote site students, instruction accounted for 49 percent of the variance and when course management was added, 57 percent of the variance could be accounted for. For origination site students, instruction could account for only 40 percent of the variance. Adding membership increased that number to 50 percent and adding technical aspects raised the percent of variance accounted for to 53 percent. The regression analysis results can be seen in Table 9.

Table 9: Stepwise regression findings for sample satisfaction

Variables entered	Probability	Total R^2
All Community College Students		
Instruction	.0000	.46
Membership	.0000	.52
Course Management	.0019	.54
Technical Aspects	.0299	.55
Origination Site Students		
Instruction	.0000	.40
Membership	.0000	.50
Technical Aspects	.0230	.53
Remote Site Students		
Instruction	.0000	.49
Course Management	.0000	.57

Comment Analysis

As part of the survey evaluating the effectiveness of the ICN for instruction, students were asked to respond to two open-ended questions. One question asked them to describe what they liked

best about taking an interactive television class while the second asked them to provide suggestions for improvement. Among the 210 surveys returned, 110 students responded to the first open-ended question and 107 responded to the second. The numbers of origination and remote students responding to the open ended questions is indicated in Table 10.

Table 10: Number and percent of students responding to the open-ended questions

Question Area	Total N (% of 210)		Origination N (% of 102)		Remote N (% of 108)	
Liked Best	110	52%	47	46%	63	58%
Suggested Improvements	107	51%	48	47%	59	55%

What students liked best. Student comments were categorized. As can be seen from Table 11, the students appear to enjoy the ability to meet others in remote locations and the opportunity to hear different viewpoints provided by the interactive television classes. One student commented, "You get a chance to talk with people from many different areas" while another said, "It gives you a chance to relate with people in other sites and you get a better variety of students with different questions and answers." The excitement of experiencing a new technology was apparent in several comments as students said, "we learn to use new technology," "it was a new experience," it was "nice to be exposed to fiber optics," and it is "exciting to be part of the future." Students also appreciated the increased access to learning opportunities saying, "it gives us more available course options." The convenience provided by interactive television classes was another plus for the students. One student commented that "It allows me to take courses offered in a location too far away to travel to." The students also appeared to like the smaller class sizes saying that they liked the "relaxed atmosphere," and the fact that "there are not many people at my site."

However, Table 11 also shows that while the most frequently mentioned replies from origination students concerning what they liked best referred to interaction with students at other sites and experiencing new technology, the most frequently mentioned responses from remote site students

referred to convenience, increased access to learning opportunities, and interaction with students at other sites.

Table 11: Categorized comments : What students liked best about their interactive television class

Comment category	N Total	N Origination	N Remote
Interaction with students at other sites	37	27	10
New technology/new learning experience	28	19	9
Convenience/classes offered close to home	25	4	21
Increased access to learning opportunities	13	3	10
Smaller classes	10	2	8
Learned a lot/enjoyed class	9	6	3
Interaction with the instructor	8	2	6
Physical presence of instructor (0)/site visits (R)	6	3	3
More relaxed atmosphere	6	3	3
Equipment visual capabilities	6	1	5
Classes offered at convenient times	4	1	3
No instructor in the class	4	0	4
Just like regular class	3	1	2
Saves money	2	1	1
Limited time commitment	2	0	2
Meets needs of special populations	2	0	2
Better than correspondence course	1	0	1

Note: Numbers reflect multiple responses from individuals

Suggestions for change. There were several areas where students recommended improvement through their written comments. Improving the technical capabilities of the microphones and cameras topped the list. Students recommended different microphones (perhaps headsets or voice-activated) and suggested a need for student training in use of the microphones. Cameras also needed improvements according to the students. They indicated that the classrooms "need cameras that are not fixed," "need switchable student cameras," "need a zoom lens on the remote site to see the other class better," "need swivel cameras and hidden cameras," and "need control of the cameras at the remote sites."

Transporting materials between sites and technical difficulties also caused problems for the students. They recommended a "better system of getting materials to remote site students," and "more effective material transport between sites." Although not specific, many students indicated that technical difficulties interfered with their learning saying "too many technical difficulties with the

system slow down class." Students also indicated a need to improve opportunities for communication with the instructor, saying it was "hard to talk to the professor on a one-on-one basis."

Table 12 shows the categorized comments regarding suggestions for improvement. Again, the most frequently mentioned areas for remote and origination site students differed. While the top three areas suggested by origination site students were improving the microphones, improving the cameras, and improving remote site student participation, the top three suggestions from remote site students involved improvements in the transportation of materials, improved opportunities for one-on-one communication with the instructor, and managing disruptive behaviors of remote site students. Remote site students appeared to have greater concerns with disruptive behavior in the classroom, student level of comfort with interacting in the interactive television environment, student attentiveness, and access to resources than origination site students. Origination site students appeared to have more concerns related to student comfort with using the microphones and a perceived lack of participation on the part of the remote site students. Origination site students also suggested providing opportunities to meet face-to-face with remote site students.

Table 12: Categorized comments: Suggestions for improvement of the interactive television class

Comment category	N Total	N Origination	N Remote
Improved microphones	19	13	6
Improved transportation of materials	18	5	13
Improved camera capabilities	14	8	6
More opportunity for 1-on-1 teacher communication	14	5	9
Decrease technical problems	11	5	6
Make visuals easier to see/read	10	4	6
Improve remote site student behavior	9	1	8
Help students feel more comfortable interacting	8	1	7
Have instructor visit remote sites	8	2	6
Improve remote site student participation	7	6	1
Improved student use of microphones	6	5	1
Origination and remote students meet face-to-face	4	4	0
Get rid of program/do not take	4	2	2
Better access to resources (i.e. library)	3	0	3
More classes available	3	3	0
Use techniques to help students stay attentive	3	0	3
Larger/better monitors	2	2	0
Shorter classes/more breaks	2	0	2
Different hours	1	1	0
Ability to see all remote sites simultaneously	1	1	0

Note: Numbers reflect multiple responses from individuals

Conclusions and Recommendations

Distance education is growing, and changes in technology are changing the focus of distance education. Iowa is at the forefront of change as it implements use of a fiber optic network to deliver two-way, full motion, interactive television instruction which allows two way interaction between and among students and instructors both verbally and visually. Evaluation of the ICN and its use in education is important as Iowa demonstrates to the rest of the nation the use of fiber optic networks for interactive television instruction. One of the first areas to assess, based on an evaluation model developed by Kirkpatrick, is the satisfaction of those participating in the learning experience.

The evaluation data suggest that overall, community college students are satisfied with courses taught over the ICN. This suggests that the ICN is an effective tool for serving the community college population.

In summarizing the individual items, students felt the equipment was adequate and easy to use; they felt the instructor attended to students and involved them in the class; and they would take another distance course and recommend the courses to their friends. Students liked the opportunity to interact with students at other sites and remote students appreciated the opportunity to take classes without the inconvenience of traveling. Students had positive perceptions of the instructors and the technology.

In reviewing the Likert items, it appears that students felt technical problems interfered with learning in the distance classroom, materials were not always delivered in a timely manner, classroom behaviors were sometimes distracting, "being on TV" inhibited participation for some, and although students personally felt a strong sense of class membership, that sense of membership did not always extend to the remote classroom. Remote site students also felt that they were not paying as much attention as they would in a regular class and, in some cases, that they were not learning as much. Course management and membership were the lowest rated among the constructs, suggesting a need for improvement in these areas.

Whether or not the student had previous experience with distance education and whether there were two sites connected or multiple sites connected appeared to make no difference in ratings for

any of the constructs. The comments of the students reflected many of the same concerns found in the Likert items. In addition, the comments provide suggestions for improving the audio (microphone) and video (camera) components of the classroom.

It appears that the quality of instruction is the primary predictor of satisfaction for both remote and origination site students, although more so for remote site students. It also appears that while course management is an important variable in determining the satisfaction of remote site students, it is much less important for origination site students. The students' sense of class membership is a more important factor for students at the origination site.

The areas where students reported the most concerns are also the areas the literature identifies. Cookson (1989) used qualitative methods and found dissatisfaction with turn around time of materials as did Garrison (1990) in a quantitative survey. Massoumian (1989) says that problems with the technology, such as poor audio or video or equipment malfunction, can disrupt the classroom, and Massoumian (1989) and Moore, Burton, and Dodl (1991) point out that remote sites without a teacher's presence can experience disciplinary problems. Finally, several articles point out the difficulty of maintaining interactions with the remote site students (Fulford & Zhang, 1993; Garrison, 1990; Heinzen & Alberico, 1990; Keston & Burgess, 1984; Silvernail & Johnson, 1992).

Findings from the study support the findings reported in the literature. It appears that students involved in instructional activities over the ICN perceive many of the same benefits and many of the same barriers as students involved in other forms of telecommunicated instruction. Therefore, many of the suggestions for improvement generated through the evaluation are applicable to other distance education environments. Recommendations for improvement include more emphasis on support management functions, increased attention to the level of interactivity in the distance classroom, training for instructors, and an orientation for students.

Based on the results of this study, several recommendations are made:

Institutions involved in distance education activities need to pay more attention to course management and support functions, particularly for remote site students.

- Transportation of materials between sites needs to be improved.
- Improvements in dissemination of information about course opportunities are needed.
- Adequate on-site facilitation is needed in remote classrooms.
- Access to resources such as library materials is needed for remote students.

Institutions using interactive technologies need to provide the best technical quality possible.

- Institutions should consider options in audio (microphones) and video (cameras) equipment configurations.
- Institutions need to resolve technical problems as quickly as possible and establish mechanisms to assist instructors in coping with technical difficulties.

Instructors involved in distance education activities need adequate training to allow them to be successful distance educators.

- Instructors need to be aware of differences among students in perceptions of interaction and the need for interaction.
- Instructors need to pay particular attention to involving remote site students in classroom activities and creating opportunities for remote and origination students to work together to enhance group membership.
- Instructors need to practice techniques, such as looking into the camera, that will help remote students feel the instructor is speaking to them.
- Cooperative relationships are needed with the on-site facilitators.
- Training is needed in creating and using appropriate visual aids.
- Instructors need to establish communication channels for students outside of class time.

Students need an orientation to interactive instruction.

- Students need instruction on using the microphones.
- Ground rules need to be established to promote a distraction-free environment.

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